U. S. DEPARTMENT OF AGRICULTURE

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PREPARING JOHNSON HAY FOR MARKET

IN THE BLACK PRAIRIE BELT OF ALABAMA AND MISSISSIPPI

PRODUCTION OF JOHNSON HAY is one of the leading farm enterprises of the Black Prairie Belt of Alabama and Mississippi. It is likely to remain an important enterprise, as it offers the most economical means of profitably utilizing extensive areas of land that are now occupied by Johnson grass.

Market conditions at present are far from satisfactory to Johnson-hay producers in this area. Decreasing demand and a wide price disparity between Johnson hay and timothy of comparable quality bring about a situation that is rather disheartening to farmers with whom the production of Johnson hay is a leading enterprise.

Too large a percentage of the Johnson hay now produced is of poor quality because of weather damage, the presence of weeds and trash, or the use of careless methods of curing, baling, and storing. The dumping of this low-grade hay on the market has resulted in such a prejudice against Johnson hay in some markets that there is no demand for even the best quality of the product.

A healthy demand for Johnson hay can be revived only by keeping low-grade hay off the market and by shipping hay of such quality as will meet the market requirements. Producers of Johnson hay must adopt methods of preparing their product for market that will enable them to produce a much larger percentage of quality hay if the enterprise is to be conducted on a profitable basis.

Production of quality hay can be increased by better management of meadows, by cutting at the proper time, and by more careful attention to proper methods of curing, baling, and storing.

Washington, D. C. Issued November, 1928

PREPARING JOHNSON HAY FOR MARKET IN THE BLACK PRAIRIE BELT OF ALABAMA AND MISSISSIPPI[1]

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INTRODUCTION

THE cotton sections of the South are generally lacking in perennial hay crops, and the principal consuming and distributing centers are largely dependent on outside producing sections for the bulk of their hay supply. This condition necessitates the shipping in of large quantities of hay from northern and western sections, and since most of this hay must be transported from a considerable distance, freight and handling charges add enormously to the ultimate cost to the consumer. It is obvious, therefore, that in such an extensive hay-deficit area there is inducement for increased hay production in those sections where it can be produced economically.

The Black Prairie Belt of Alabama and Mississippi is the only extensive hay-surplus area in the Southeastern States. Here Johnson grass is at present the most important hay crop. It thrives on the heavy clay soils and has gradually spread until in many sections it now occupies the land almost to the exclusion of other crops. The production of hay offers the most practicable means of economically utilizing these extensive acreages of land that are in Johnson grass.[2]

[1] Acknowledgments are due the numerous farmers, county agricultural agents, hay dealers, and hay inspectors who were interviewed in securing information for this bulletin. The author is also indebted to the Alabama Department of Agriculture, the Alabama Agricultural Experiment Station, and the Mississippi Agricultural Experiment Station for helpful suggestions and assistance in securing the field data.

[2] Farmers' Bulletin No. 1546, Systems of Livestock Farming in the Black Prairie Belt of Alabama and Mississippi, discusses the importance of hay production in connection with various types of livestock production.

The production of Johnson hay for market is already an important enterprise in this territory, and there is room for considerable expansion of the industry since the total production of marketable product is by no means sufficient to meet the requirements of readily available markets. But better and more effective methods of producing a high quality of hay are of much greater importance at the present time than is increased production, for the market for Johnson hay is in anything but a satisfactory condition, and a large percentage of the hay now produced goes begging for a market because it fails to meet the requirements of the top grades.

The production of a high quality of Johnson hay in a humid climate is often difficult on account of unfavorable weather and other conditions, and a distressingly large percentage of the Johnson hay now produced is of poor quality. Many farmers in this area have become hay producers from necessity rather than choice and are unfamiliar with methods of producing the best quality of hay. With others, the production of hay is merely a side line to other farm enterprises; odd patches of Johnson grass are cut during spare time, and little or no thought is given to producing high quality hay. The result is that a high percentage of overripe, weedy, trashy, and weather-damaged hay is produced. Efficient methods of handling the crop so as to produce a high quality of hay and reduce loss to a minimum have been worked out by many of the more successful producers. It is the purpose of this bulletin to point out the principal causes of low-grade hay and to outline the practices of some of the more successful producers.

DEVELOPMENT OF HAY PRODUCTION IN THE AREA

Commercial hay production in the Black Prairie Belt was relatively unimportant prior to 1899. Individual farms were producing hay for market, but the area as a whole was not on a hay-surplus basis. Only 2 per cent of the land in crops harvested was occupied by hay and forage crops, according to census figures. After 1899 the spread of Johnson grass compelled many farmers to give attention to hay production in order that they might realize something from land that was infested with this grass. As a result, the 10-year period ended in 1909 saw an increase of 131 per cent in the acreage devoted to hay and forage. At this time 96,243 acres, or 4.6 per cent, of the land in crops harvested was in hay and forage.

A still more rapid increase in hay production took place between 1909 and 1919, and in the latter year hay and forage crops occupied 13 per cent of the land in crops harvested. This rapid increase in hay production was due to the continued spread of Johnson grass, to an expansion of alfalfa production, and to the stimulus of high prices for hay that prevailed from 1917 to 1920. Between 1919 and 1925 the acreage in hay and forage crops decreased nearly 20 per cent. This decrease was due largely to the fact that hay prices declined rapidly, while production costs remained at a high level, a combination of conditions which caused many meadows to be neglected or to lie idle between 1921 and 1925.

Many changes have taken place in production practices since Johnson hay became an important crop in this belt. In the early days

hay production was merely a side line and the haying equipment usually consisted of a 4½ or 5 foot mower, a dump rake, and a horsepower press. The crop was cut when convenient, usually after the Johnson grass had matured seed, with little regard to cutting at the time necessary for producing a good quality of hay. To-day wide-cut mowers are in common use, many large producers are using tractors instead of horses or mules for motive power in mowing, and various other types of labor-saving machinery are coming into use. (Figs. 1 and 2.) Baling is practically all done with power presses, and horse presses are seldom seen. The more progressive producers are giving thought to the development of practices that will maintain yields, increase efficiency, and produce a maximum percentage of high-quality product.

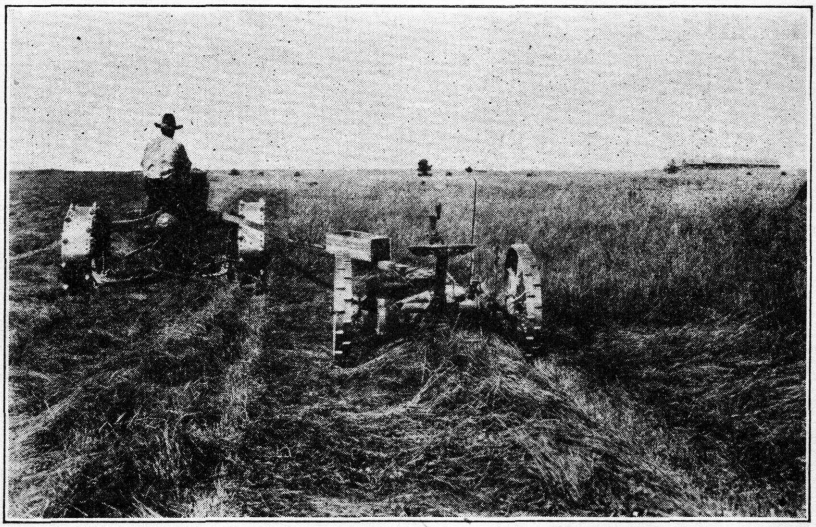

FIG. 1.—Some of the large Johnson-hay producers are using tractors in mowing. With this outfit one man can cut from 30 to 40 acres a day

CLIMATIC CONDITIONS

Length of growing season, amount and seasonable distribution of rainfall, and amount of sunshine during the haying season are factors that have much to do with both quantity and quality of Johnson hay. The average annual precipitation for the area is about 51 inches, and normally about 23 inches of this occurs during the six months when haying is carried on. The rainfall is likely to be irregularly distributed during the haying season. Local showers are often of frequent occurrence and are likely seriously to hamper haying operations. On the other hand, droughty conditions—occasionally general, but more frequently local—sometimes prevail between the months of May and November, and it is not uncommon for a relatively small district to suffer severely from drought while the surrounding country has ample rainfall, or vice versa. When these periodic droughts occur they tend greatly to reduce yields. This uncertainty of weather

greatly increases the risk in Johnson-hay production in the Black Prairie Belt, and hay producers have to be constantly on the alert to guard against serious loss from weather-damaged hay.

MARKETS AND MARKETING

MARKETS FOR JOHNSON HAY

Birmingham is the principal market for Johnson hay, and Atlanta ranks next in importance. Markets of less importance are Mobile, Ala., New Orleans, La., Meridian and Hattiesburg, Miss., and Columbus, Ga. Montgomery, located in the producing section, is an important shipping market. Jacksonville was formerly a good market, but the receipt of such a large percentage of low-grade hay has practically destroyed the demand for Johnson hay in that market.

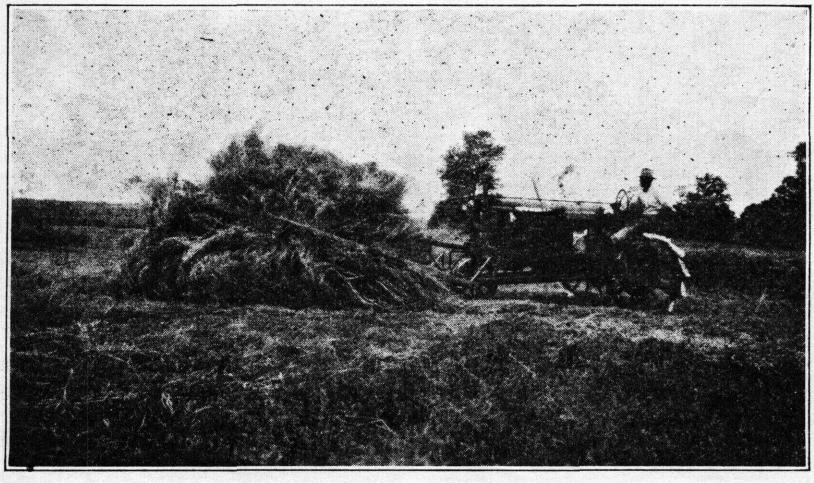

FIG. 2.—A push rake operated with a tractor saves both man and horse labor. Such an outfit can deliver from 600 to 800 pounds of hay at a load and easily keep the press working at full capacity

The demand for Johnson hay is on the decrease in most of the larger consuming and distributing markets. According to the Mobile Chamber of Commerce: "* * * the demand for Johnson hay has been decreasing for some time, this being due to the inferior grade of hay now being shipped * * *." The New Orleans Association of Commerce says: "The demand for this hay seems to be on the decrease rather than on the increase."

It is estimated that the Birmingham district annually receives about 2,400 cars of hay, of which about 35 per cent is Johnson, 30 per cent timothy, 25 per cent alfalfa, and 10 per cent made up of clover, timothy and clover mixed, Johnson and alfalfa mixed, Bermuda, and prairie hay. Atlanta takes about 1,800 cars of hay annually. Of this, about 15 per cent is Johnson, and the remainder is about equally divided between timothy and alfalfa, and includes a small quantity of clover and mixed hay. The annual consumption of hay in New Orleans amounts to about 1,000 cars, of which about

5 per cent is Johnson. Mobile uses about 400 cars, of which Johnson hay constitutes about 10 per cent.

Dealers and inspectors state that much of the timothy now received in these markets would be replaced with Johnson hay if there were any assurance that a good quality of hay could be procured. This indicates that increased quanties of high-grade Johnson hay would find a ready sale. The replacement with Johnson hay of one-half of the timothy now received in these markets would necessitate doubling the quantity of high-grade Johnson hay now being produced in the entire Black Prairie Belt.

Aside from the city markets, a considerable quantity of Johnson hay is consumed in the lumber and sawmill camps in Georgia, Florida, Alabama, and Mississippi. Part of this supply is purchased through brokers and part direct from the producer. This market is usually satisfactory when the hay shipped comes up to the grade claimed for it, and a number of producers have built up a good trade by always shipping hay according to contract. Many of these consumers will buy a lower grade of hay than that demanded by the city trade, provided the price is right. These markets offer an outlet for a considerable quantity of the low-grade hay for which there is no demand in the larger markets.

MARKET DEMANDS

In general, the trade demands a high quality of Johnson hay, and the larger markets appear to have but little call for anything lower than U. S. No. 2. Nor is the demand for the lower grades of Johnson hay likely to strengthen, for with the constantly increasing use of automobiles and trucks the consumption of hay is on the decrease, and Johnson hay is thus being forced into keener competition with hay shipped into the South from northern and western hay-surplus areas.

The wholesale hay trade generally prefers Johnson hay in small, two-wire, 14 by 16 by 40 to 44 inch bales, weighing approximately 80 pounds. Most producers endeavor to bale their hay to conform with this demand. Many of the small feed dealers retail hay in less than ton lots, and prefer a 60 to 65 pound bale. This class of dealer purchases hay by the ton and sells it by the bale.

The present unsatisfactory condition of the Johnson-hay market is due largely to prejudice against the product, brought about by the receipt of quantities of low-grade, trashy, and heat-damaged hay. In some markets this prejudice has become so strong that there is no demand for even the best quality of Johnson hay. There is no question as to the value and desirability of good Johnson hay, but dealers with an established trade, who have to depend on hay shipped from a distance, are reluctant to take a chance on an uncertain product when they can get a standard hay such as timothy that will be reasonably sure to measure up to grade. It is obvious, therefore, that the demand for Johnson hay will not be restored in such markets until the prejudice against it is removed; and this can be accomplished only by keeping low-grade hay off the market and shipping only such quality of product as will meet the requirements of the trade and measure up to the grade claimed for it.

Local shippers can aid materially in strengthening the demand for Johnson hay by carefully sorting the hay before loading it in cars, and by shipping only the class and quality called for. Shipping hay of mixed quality generally results in an unsatisfactory return, as it will usually be sold on the basis of the lowest quality rather than on the average quality of the carload. Shippers unable to fill an order with the quality of hay called for will sometimes ship a lower grade and trust to luck that the buyer will accept it, or at least make a satisfactory price adjustment. This practice has had much to do with injuring the demand for Johnson hay.

MARKETING METHODS

The marketing of Johnson hay is handled in several different ways. Many producers sell most of their product direct to the consumer. This is usually a satisfactory method where the producer is able to make the necessary contacts with consumers, as it affords the conscientious producer an opportunity to maintain satisfactory trade relations with his customers and always have a market for his product. Some producers market their hay mainly through brokers, and still others sell most of their product to local buyers. The latter practice is most common, and the bulk of the Johnson hay here produced is marketed in this manner.

No one method can be said to be best at all times. The producer needs to keep in close touch with the market in order to secure the best price for his product. The producer who has gained a reputation for square dealing, and for putting up a good quality of hay, will seldom have difficulty in marketing his product at a satisfactory price.

PRICES

The price differential between No. 1 and No. 2 Johnson hay is usually from $2 to $3 a ton. According to one producer-shipper, prices per ton for No. 1 Johnson hay f. o. b. cars at Montgomery, Ala., from 1919 to 1927 averaged about as follows:

1919–20	$20.00	1924–25	$18.60
1921–22	15.00	1925–26	22.00
1922–23	16.00	1926–27	15.00
1923–24	16.17		

Prices for 1925–26 and 1926–27 are for U. S. grades; all others are for National Hay Association grades. The high price in 1925–26 was partly due to the fact that very little No. 1 was produced because of unsually bad weather.

In most markets there is usually a wide spread between the price of Johnson hay and timothy of comparable quality. For example: On August 19, 1927, Birmingham dealers were quoting No. 1 timothy (National Hay Association Grades) at $21.50 to $22, and No. 1 Johnson at $14 to $16 per ton. Dealers assume that considerable risk is attached to handling even the better grades of Johnson hay because such a large percentage is improperly cured and likely to go out of condition while in transit, or if held in storage for any length of time, whereas timothy is usually well cured and seldom depreciates in feeding value after arrival. This is given as a reason for the

disparity in prices, but it is hardly conceivable that it is sufficient justification for a spread of from $6 to $7.50 per ton between comparable grades of Johnson and timothy hay. However, this price disparity serves further to emphasize the outstanding need of more careful practices in curing and baling before Johnson hay can be expected to enjoy its rightful place in the market.

GRADES [3]

Official standards for Johnson and Johnson Mixed Hay were promulgated by the United States Department of Agriculture in August, 1925. The definitions and specifications employed in these standards may be found in the Handbook of Official Hay Standards, issued by the Bureau of Agricultural Economics.

In these official standards Johnson and Johnson Mixed Hay are divided into five classes, namely, Johnson, Johnson Light Grass Mixed, Johnson Heavy Grass Mixed, Johnson Light Alfalfa Mixed, and Johnson Light Lespedeza Mixed. The class Johnson applies only to hay that is nearly pure Johnson grass, although permitting a maximum of 10 per cent other grasses, 10 per cent cane hay, and 10 per cent legumes. The class Johnson Light Grass Mixed signifies a type of Johnson hay that has a light mixture of other grasses (over 10 per cent but not over 30 per cent) and not over 10 per cent legumes. The other classes are based on similar percentage allowances.

The various classes are divided into three numerical grades and a Sample grade. The grading factors in the numerical grades are color and foreign material. Color is the more important factor because it is an indication of quality in hay. Thus the grade varies in these standards according to the quantity of natural green color preserved in the hay.

Foreign material affects the grade according to the quantity contained in the hay, and thus the grade may be lowered on account of foreign material, even though the hay is green and well cured. Sample grade is used to describe hay which contains excessive quantities of foreign material, which is unsound because of a heating, is hot, wet, musty, or in caked condition, or which is severely stained, overripe, or weathered.

Special grades for extra green hay, fine hay, and coarse hay are used to supplement the numerical grades when the hay has these special qualities. The special grade Fine indicates a type of early cut and leafy Johnson hay that has relatively high-feed value as compared with Johnson hay with coarse stalks. The special grade Coarse indicates Johnson hay that is mature as well as hay that has stalks of large diameter.

CAUSES OF LOW-GRADE HAY

Numerous circumstances are responsible for the large quantity of low-grade hay normally produced in the Black Prairie Belt. Among

[3] Supplied by E. C. Parker, assistant chief marketing specialist, in charge of hay standardization.

these are unfavorable weather; the presence of weeds or such trash as cornstalks and cotton stalks; delay in cutting until the grass stems are woody and unpalatable, the bottom leaves dead and brown, and the seed heads mature; inadequate equipment for handling the crop expeditiously; careless curing methods; putting up hay in poorly constructed cocks or stacks; baling before the hay is properly cured; heat damage caused by storing freshly baled hay in barns or warehouses without proper ventilation between the bales; storing in sheds or barns that have leaky roofs; and shipping too soon after baling, with the result that the hay heats and goes out of condition while in transit.

All things considered, the weather factor is probably the most serious problem confronting the producer of Johnson hay when it comes to putting up a high percentage of good-grade product. Not only is a large quantity of hay damaged each year by being rained on while in the swath or windrow, but a prolonged rainy spell will frequently delay cutting until the grass is past the stage for making a good quality of hay. A certain amount of damage from rains is unavoidable, for with a haying season extending over a period of five to six months in a humid climate it is obvious that even the most efficient producers will at times meet with difficulty in curing their hay in a satisfactory manner. Intermittent showers are likely to occur after the grass is cut, and when this happens bleached or otherwise-damaged hay is almost sure to result.

A small percentage of weeds is unavoidable in Johnson hay, but a high percentage of weedy hay is usually an indication of poor meadow management, or of a cool, backward spring which has retarded the growth of Johnson grass and given various hardy weeds a chance to get a good start in the meadows. In the latter case the first cutting will be weedy, but if the stand of Johnson grass is good there will be little trouble from weeds in the second and later cuttings. Farmers' Bulletin 1476, Johnson Grass: Its Production for Hay and Pasture, discusses weed control in Johnson-grass meadows.

The presence of any considerable quantity of cornstalks, cotton stalks, or other foreign material lowers the grade of Johnson hay, even though the hay itself is of good quality. Trashy hay of this sort usually results where cultivated land is first converted into meadow, or where a crop of corn or cotton has been grown on land that was broken up for the purpose of thickening the stand of Johnson grass, or where scattered bunches of damaged hay from the previous cutting have been left on the meadow. Meadows should always be cleaned of all trash before the Johnson grass starts in the spring, and should be raked clean after each cutting so that no bunches of old hay are left to be raked up with the succeeding crops.

Failure to cut Johnson grass at the proper stage of maturity is one of the most common causes of low-grade hay. This delay in cutting is sometimes unavoidable on account of inclement weather, but probably just as frequently is due to ignorance of the proper time to cut, or to a lack of time caused by the demands of crops that compete with the hay crop in the employment of labor. Whenever mowing is delayed until the stems are woody and unpalatable many of the bottom leaves will have become dead and brown, and

the result will be a product that is low in feeding value as well as badly off in color.

The best time to cut is when the heads are just emerging from the "boot," but where a large acreage is handled it is impossible to cut all of the first crop when the grass is in the proper stage. However, Johnson grass, and especially the first cutting, is likely to be uneven in development, and one meadow or a portion of a meadow may be ready to cut several days ahead of the rest. When this occurs cutting should begin on the more advanced portion as soon as it is ready. Later crops may be cut at approximately the right time by cutting the meadows in the same order as that followed in cutting the first crop.

Inadequate equipment is responsible for the failure of some producers to put up a larger proportion of marketable hay. Frequently a producer with 200 to 300 acres of Johnson grass will have only such equipment as will enable him to handle one-half of his acreage in a satisfactory way. The result is that he is usually behind, and either a large proportion of his crop is left too long before cutting, or he cuts a larger acreage than he can possibly save in good condition.

Careless and slipshod methods of handling hay while it is curing are responsible for a considerable quantity of low-grade hay. Leaving hay exposed to heavy dew and bright sunshine for several days while in the swath or windrow will cause bleaching and will materially lower the grade. On partly cured hay, two heavy dews alternating with hot sunshine will do more damage than a heavy shower. Hay in large windrows is likely to weather stain in damp, cloudy weather unless the windrows are turned over and aired. The more successful producers strive to get their hay in the bale, the cock, or the stack with the least possible exposure to the weather.

Putting up hay in loose, poorly topped cocks, or in stacks that are not constructed to shed rain, or stacking on low moist land where hay in the bottom of the stack will absorb ground moisture, result in much damaged hay. Hay put up in large, well-built cocks will stand considerable rain with but little damage, but careful supervision of labor is necessary to have such work properly done. The same holds true for stacking hay, but, unfortunately, laborers who have the ability to build a good stack are not plentiful in this area.

Baling hay before it is properly cured usually results in a heat-damaged product. Likewise, storing freshly baled hay in poorly ventilated barns or warehouses, or without leaving air spaces between the bales is more than likely to result in considerable damage from heating.

Hay baled from the windrow or cock should remain in storage from 20 to 30 days before it is shipped. The bales should be piled on edge and each tier cross-piled on the tier below. Hay shipped immediately after baling from the windrow is almost certain to heat in transit and result in a moldy, heat-caked product when it arrives at destination. This results in lowering the quality of the hay and is one of the most common sources of trouble between shippers and receivers of Johnson hay. Considerable quantities of good Johnson hay are ruined each year by being stored in old cabins, sheds, or barns with leaky roofs.

Buildings used for storing baled hay may be inexpensive, but it is essential that they be well ventilated and well roofed.

ESSENTIALS OF PROFITABLE HAY PRODUCTION

Maximum returns from Johnson-hay production can be realized only by adopting methods of management that result in keeping the meadows relatively free from weeds and in a high state of productivity, and by giving close attention to hay-making practices that result in efficiency and the production of a high quality of product. Good meadow management is essential in order that both quality and quantity of hay may be produced. Fortunately, the practices that are necessary for producing maximum yields also cover some of the principal requirements for the production of the best quality of hay.

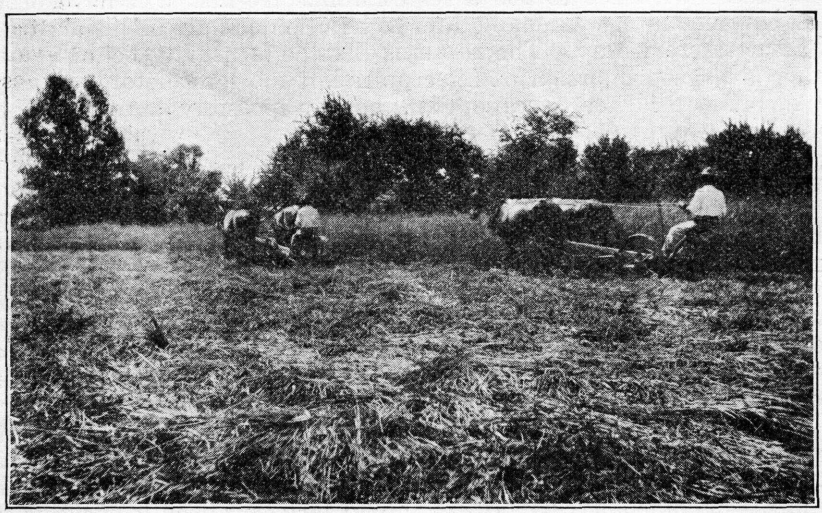

FIG. 3.—On some of the more fertile soils Johnson grass will produce from three to four cuttings a year, yielding from 2 to 3 tons to the acre for the season. This field produced four cuttings a year, with an aggregate yield of 4 tons to the acre

A well-managed Johnson grass meadow should produce from three to four cuttings a year, yielding a total of 2 to 3 tons per acre, and even better yields are frequently secured on some of the more fertile areas. (Fig. 3.) But on many of the older meadows the annual removal of a considerable tonnage of hay has resulted in greatly reduced yields, in some instances to an extent where production is no longer profitable.

Many producers claim that with the prevailing low prices for Johnson hay it is impossible to secure a profitable return when the yield falls below half a ton to the acre for each of the two or more cuttings made during the season. This may not be true in all instances, but very efficient management is necessary to bring a satisfactory return from such low yields. Satisfactory yields can be secured only by maintaining a good stand of grass, and by proper attention to keeping up the fertility of the soil. Methods of meadow management for maintaining good stands of Johnson grass and prac-

tices resulting in maximum production are discussed in detail in Farmers' Bulletin 1476, Johnson Grass: Its Production for Hay and Pasturage.

METHODS OF PREPARING JOHNSON HAY FOR MARKET

Producers differ widely in their methods of preparing Johnson hay for market. It can hardly be said that there is any usual practice of haymaking for the area as a whole, but every producer of consequence follows a more or less definite system under normal conditions. Some practice curing in the swath and windrow, and bale directly from the windrow; others put the hay up in cocks before it is thoroughly cured and bale after it has stood in the cock for several days; still others follow the practice of stacking their hay and letting it go through the sweating or fermenting process before baling.

Practically all producers find it necessary or desirable to vary their practices from time to time to conform to weather conditions, available equipment, supply of labor, and acreage to be harvested. Those who make a practice of baling from the windrow sometimes find it necessary to cock or stack part of their hay in unfavorable weather or when there is a shortage of labor, and those who usually stack their hay will often bale a part of their product from the windrow or cock when weather conditions are unusually favorable and when there is an ample supply of labor. Methods employed under large-scale production are likely to differ from those where production is on a small scale.

Under normal conditions the windrow-baling and the stacking methods are most common. Each has certain things in its favor, the question as to which is the better method depending largely on the efficiency of the farm organization, on weather conditions at haying time, on the supply of labor, and on the amount of room available for storing the baled hay.

Baling from the windrow is more generally practiced by extensive hay producers whose farms are organized and equipped to handle the crop efficiently. Under favorable conditions this is undoubtedly the most economical method of handling Johnson hay.

Two methods of stacking are in vogue—putting the hay in 12 to 15 ton stacks with the use of a stacker (figs. 4 and 5), and stacking by hand in small stacks of from 1 to 3 tons each (figs. 6 and 7). The latter is the more common method. The use of stackers would probably be more general if more men were skilled in building large stacks so as to shed rain, or if producers were not reluctant to invest in equipment with which they are not familiar.

Various methods of mowing, curing, stacking, and baling Johnson hay are discussed in Farmers' Bulletin 1476, Johnson Grass: Its Production for Hay and Pasture.

EXAMPLES OF HAY-MAKING PRACTICES

Examples of practices followed by different producers are here given to illustrate the windrow-baling method, the large-stack method, and the small-stack method of handling Johnson hay. These are presented as typical examples of methods followed by some of the

producers who are successful in putting up a maximum quantity of high-quality hay. In general, they represent the most efficient practices in handling Johnson hay under the various conditions that exist on different types of farms in this area.

FARM NO. 1

Farm No. 1 is a highly specialized farm on which hay is the only crop produced. Approximately 1,500 acres of Johnson grass are cut annually. About 1,000 acres are cut twice, and the remainder is cut three times, making the season's total mowing about 3,500 acres. A large portion of the land on this farm is thin and relatively unproductive, so yields range from about one-fourth to 1 ton to the acre per cutting. In spite of this low yield, the operator of this farm is one of the most successful hay producers in the section in the efficient use of labor and in saving a maximum amount of high-quality hay.

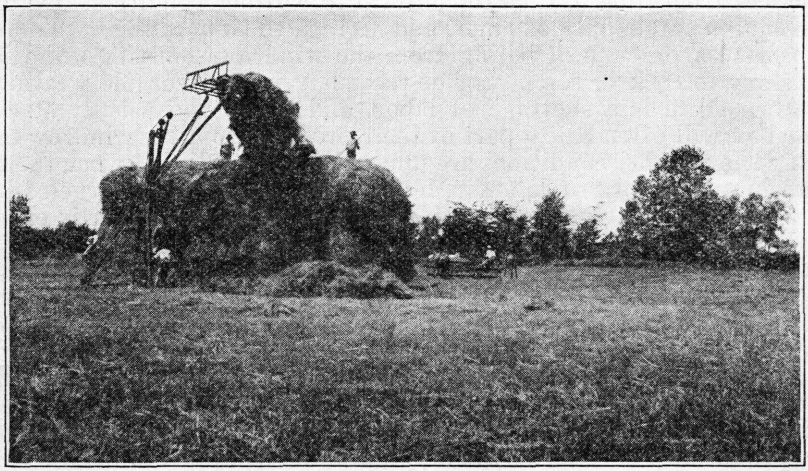

FIG. 4.—By building large stacks with a stacker and push rakes, hay can be handled much more efficiently than when put by hand into small stacks, such as those shown in Figures 6 and 7

His success is due largely to the use of power machinery, efficient management, and personal supervision of all of the work.

All work except that with the self-dump rakes is performed with power-operated machinery. The mowing is done with two 6-foot mowers drawn by a tractor. One man with this outfit does all the mowing, the average day's cut ranging from 35 to 40 acres. Mowing starts as soon as the grass begins to head and, on account of the extensive acreage operated, continues with but little interruption (except for bad weather) until the end of the season.

Under normal conditions the usual method of curing and baling is to let the hay lie in the swath for about 24 hours after mowing, then rake into windrows, and bale the following day. In exceptionally favorable weather, and when the ground is dry, hay cut in the morning is frequently raked into windrows in the afternoon of the same day and baled the day following, and on some occasions hay has been cut and baled the same day without loss. In uncertain weather,

when baling from the windrow would be unsafe, the hay is sometimes put up in large cocks and left until the weather becomes settled before being baled.

The baling begins as soon as about 20 tons—or enough hay for one day's baling—is cured enough to bale with safety. The hay is delivered to the press with a push rake operated with a tractor. (Fig. 2.) With this outfit from 600 to 800 pounds of hay is pushed to the press at one time, and the press is kept working at full capacity. Each load is pushed close to the press so that no time will be lost by the pitchers in getting the hay to the feeder.

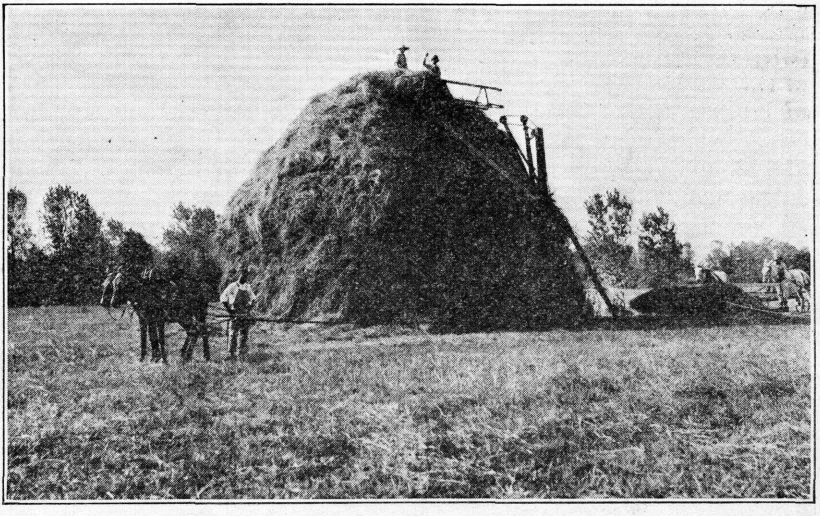

FIG. 5.—Topping out the stack with freshly cut grass. Stacks shed rain better and are less liable to have the tops blown off if they are topped out with freshly cut grass or partly cured hay

The baled hay is stored in barns and warehouses, the bales being piled on edge and cross piled, with an air space between them for ventilation. Windrow-baled hay is kept in storage from 20 to 30 days before it is shipped. Handled in this manner, hay will seldom heat in the bale and will not go out of condition while in transit.

The equipment on this farm consists of the following:

Four mules—for use on the dump rakes.
One tractor—used for mowing.
One tractor—used on push rake.
One tractor—used on hay press.
Two 6-foot mowers.
Two 12-foot self-dump rakes.
One push rake.
One hay press.
Two trucks.

The regular haying crew on this farm consists of one man and tractor at the mowing, two men and two teams at the raking, one man and tractor at the push raking, and six men at the baling. Once the haying is under way this crew of 10 men will, under normal conditions, put up an average of 18 tons a day. Expressed in hours of

man labor the time required to harvest and bale a ton of hay with yields ranging from one-half to 1 ton to the acre for each cutting is about as follows:

	½-ton yield	¾-ton yield	1-ton yield
	Hours	*Hours*	*Hours*
Mowing (with tractor)	0. 57	0. 38	0. 29
Raking (two-horse rake)	. 83	. 55	. 42
Turning windrows with rake	. 20	. 20	. 20
Push raking (with tractor)	. 55	. 55	. 55
Raking after push rake	. 08	. 08	. 08
Baling	3. 33	3. 33	3. 33
Total per ton	5. 56	5. 09	4. 87

FIG. 6.—The usual crew used in stacking by hand consists of one man on the push rake to bring the hay to the stack, one man to build the stack, and two men to pitch the hay to the man on the stack. Where stacking by hand is practiced it is not practicable to build large stacks, nor does this method permit of the most efficient use of labor

The practices followed on this farm are well suited to large-scale production, and especially where the production of hay is the principal farm enterprise. The use of power machinery results in a considerable saving of both man and horse labor in mowing and push raking, and baling from the windrow eliminates the time and labor of stacking. It must be kept in mind, however, that success in baling from the windrow is largely dependent on close attention to details on the part of the operator, and on his knowledge of when the hay is cured sufficiently to be baled with safety.

FARM NO. 2

Farm No. 2 is a hay and livestock farm on which 100 acres of Johnson grass are handled with horsepower machinery and most of the crop is baled from the windrow. This farm offers a good example of efficient hay making on a smaller scale than on farm No. 1, and with a minimum amount of equipment. The meadows on this farm are rich lowland yielding four cuttings a year, with an

average annual production of 4 tons to the acre. As the meadows are kept smooth and clean, an 8-foot mower can be used.

Haying begins when the grass is in the "boot," and the 100 acres are usually cut over in about two weeks. The mowing is done with an 8-foot mower drawn by three horses. Under normal conditions the mowing is done between 4 p. m. and 10 o'clock the following morning, and all hay is raked into windrows in the afternoon. In this way all the hay is put into windrows before any dew falls on cured hay while it is in the swath. Should the weather become showery after the hay is cut and before it has been raked it will be

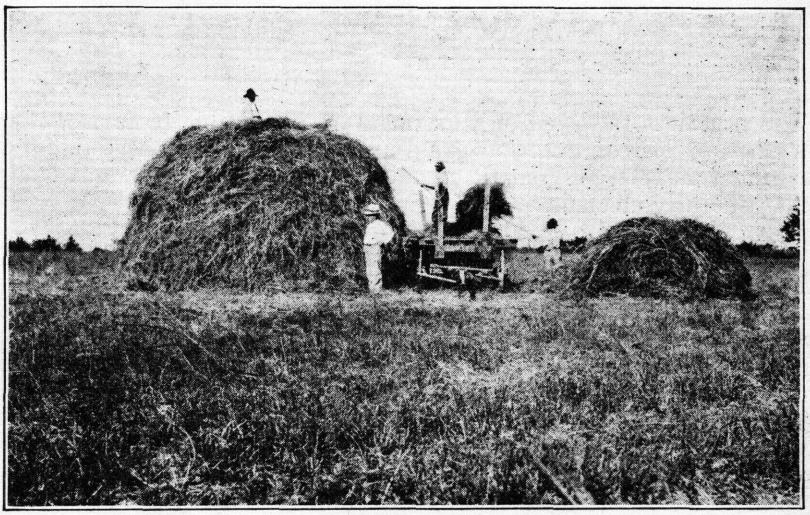

FIG. 7.—Another method of hand stacking is to place a wagon with a hayrack at the side of the stack when the latter has been built as high as a man can pitch from the ground. One man then pitches the hay to the wagon, and the second man pitches it from the wagon to the stack. This method permits the building of a larger stack, but is even more wasteful of labor than the method shown in Figure 6

left in the swath, for hay will suffer less damage from getting wet in the swath than from getting wet in the windrow.

Hay is usually baled the day after it is put in the windrow, but if not sufficiently cured for baling with safety, it will be left in the windrow for another day. Where the windrows are heavy they are turned over with the dump rake an hour or so before baling. Baling is done with a horsepower press, the hay being brought to the press with a push rake. Six men and four horses will bale an average of 12½ tons from the windrow in 10 hours.

Baled hay is stored for two weeks or more before it is shipped. When put in storage, the bales are always piled on edge, with an air space between them to permit ventilation and guard against any heating in the bale.

The equipment on this farm consists of the following:

Eight horses.
One 8-foot three-horse mower.
One 12-foot self-dump rake.
One push rake.
One two-horse press.

Eight men can cut, cure, and bale an average of 12½ tons in a 10-hour day. The number of man hours required to harvest and bale a ton of hay for yields of one-half, three-fourths, and 1 ton to the acre for each cutting are approximately as follows:

	½-ton yield	¾-ton yield	1-ton yield
	Hours	*Hours*	*Hours*
Mowing (3 horses on 8-foot mower)	1.33	0.88	0.67
Raking (12-foot 2-horse rake)	1.00	.67	.50
Turning windrows with rake	.20	.20	.20
Push raking to press	.80	.80	.80
Raking after push rake	.08	.08	.08
Baling with horse press	4.00	4.00	4.00
Total per ton	7.41	6.63	6.25

The practices followed on this farm are applicable to farms where 100 acres or less of Johnson grass are handled. The investment in machinery is relatively small, and the handling of labor and equipment generally efficient.

FARM NO. 3

Farm No. 3 is a hay and livestock farm on which about 900 acres of Johnson grass are cut annually, and most of the hay is put up in large stacks. In addition to hay, about 80 acres of oats, 115 acres of corn, and 15 to 20 acres of miscellaneous crops are grown. Yields average about 2 tons to the acre per year.

The stand of Johnson grass is maintained by disking parts of the meadows each spring and breaking up and planting part of the land to oats or a cultivated crop every few years. Where the land is thin, it is sown to sweet clover to build up the soil and increase productivity.

The usual haying practice on this farm is to start mowing as soon as the grass begins to head and keep the mowers going until the entire acreage has been cut over. The mowing is done with two mowers—one 6-foot and one 7-foot—drawn by a tractor. An average of about 35 acres per day is cut with this outfit. As soon as the hay in the swath is well wilted it is raked into small windrows. The following day the heavier windrows are turned over with a side-delivery rake, and if the hay is well cured it is immediately stacked. If the weather is unfavorable for rapid curing and the hay not well enough cured for stacking, it will be left a day longer in the windrow. Occasionally, when conditions are favorable, part of the hay is baled from the windrow.

Stacking is done with a stacker and push rakes, and the stacks contain from 12 to 15 tons each. A crew of five men with two push rakes and a stacker put up an average of 25 tons a day. As far as practicable the stacks are built on dry, well-drained ground where the slope is away from the stack so as to minimize the danger of having hay in the bottom of the stack damaged by absorbing moisture from the ground or by water from a heavy rainfall running under the stack.

The hay is left in the stacks until it has gone through a sweat before it is baled. Before baling all hay on the outside of the stack

that has been damaged by exposure to the weather is raked off so that no weather-damaged or stained hay will get into the bales. When the market is satisfactory, hay is shipped as soon as baled; otherwise it is stored in barns and sheds. Storage room for 380 tons of baled hay is available on this farm.

The haying equipment of this farm consists of the following:

Ten horses and mules.
Two mowers (one 6-foot and one 7-foot).
One tractor used for mowing.
Two self-dump rakes.
Two push rakes.
One side-delivery rake.
One stacker.
One power press.
One 15–30 tractor used to operate press.

The crew used in cutting, curing, and stacking consists of 1 man and tractor at the mowing, 2 men and 2 teams at the raking, 2 men and 2 teams at the push raking, 1 man and team operating the stacker, and 2 men building the stack, a total of 8 men and 10 mules. With hay yielding three-fourths ton to the acre this crew will put up about 25 tons a day. The baling crew of 6 men will bale an average of about 16 tons a day from large stacks. The amount of time required per ton for cutting and raking varies with the yield per acre, whereas that for stacking and baling remains relatively constant. Under normal conditions the hours of man labor per ton in handling hay by this method will be about as follows for yields of one-half, three-fourths, and 1 ton to the acre for each cutting:

	½-ton yield	¾-ton yield	1-ton yield
	Hours	*Hours*	*Hours*
Mowing (with tractor)	0.57	0.38	0.29
Raking (2-horse rake)	.83	.55	.42
Turning windrows (2-horse rake)	.20	.20	.20
Push raking (2 horses)	.80	.80	.80
Raking after push rake (2-horse rake)	.08	.08	.08
Stacking (2 horses on stacker)	1.20	1.20	1.20
Baling	3.75	3.75	3.75
Total per ton	7.43	6.96	6.74

If the same equipment is used in cutting and raking, hay can be put up in large stacks with about 40 per cent less man labor than it requires to cut, rake, and bale from the windrow. Therefore this method of putting up hay in large stacks is suitable for handling a large acreage where labor is scarce at haying time, or where other farm enterprises interfere with haying demands for labor.

FARM NO. 4

Farm No. 4 is a cotton, corn, hay, and livestock farm. About 300 acres of Johnson grass are cut for hay each year, the average annual yield being 2 tons to the acre. Practically all the hay is put up in small stacks. Croppers and renters living on the plantation supply most of the labor used in haying. This arrangement works to the advantage of both labor and operator; the former are given occupation when they might otherwise be idle, and the latter is assured of an ample supply of labor when needed in haying.

The usual haying practice on this farm is to start mowing as soon as the Johnson grass begins to head. Mowing is done with two mowers drawn by mules, each mower cutting an average of 12 acres in a 10-hour day. In favorable weather hay that is cut in the forenoon is raked into windrows in the afternoon, and that cut in the afternoon is windrowed the following day. Hay is usually stacked the day after it is put in windrows, but if the weather is not favorable for rapid curing the hay is left in the swath until the second day before being raked and is not stacked until the third day. If the hay is heavy and rank or there is considerable moisture in the ground, the windrows are turned over with a self-dump rake an hour or so before stacking so that hay in the bottom of the windrow will dry out before being put in the stack.

Hay is brought to the stacks with push rakes and stacked by hand. The stacks are in groups of three—all three being built at the same time—and contain from 1½ to 2 tons each. The stacking crew consists of 11 men, 2 operating push rakes, and 3 at each of the stacks. This crew stacks around 36 tons a day. The hay is baled from 10 to 20 days after stacking, according to weather conditions and the labor demands of other farm work.

The equipment used in haying on this farm is:

Twelve mules.
Two mowers.
Two self-dump rakes.
Two push rakes.
One hay press.
One tractor for operating the press.

Only 8 mules are used continuously in haying; the other 4 are extras supplied from the regular farm work stock.

When haying operations are in full swing a crew of 15 men is usually employed in cutting, curing, and stacking: Two men and 2 teams, mowing, 1 man and team raking the hay into windrows, 1 man and team turning windrows and raking after the sweep rakes, 2 men on push rakes delivering hay to the stacks, and 9 men stacking. As this stacking crew can handle as much hay in one day as the mowing crew will cut in from one and one-half to three days—depending on the yield per acre—they may be employed at baling hay or other farm work about half the time. The baling crew consists of 6 men. This crew bales an average of 15 tons a day. To move and set up the press three or four times a day cuts down the efficiency of the baling crew.

On the basis of a normal 10-hour duty for the different crews the hours of man labor required to harvest, stack, and bale a ton of hay for yields of one-half, three-fourths, and 1 ton to the acre for each cutting are about as follows:

	½-ton yield	¾-ton yield	1-ton yield
	Hours	*Hours*	*Hours*
Mowing (with mules)	1. 67	1. 11	0. 83
Raking (two-horse rake)	. 83	. 55	. 42
Turning windrows (two-horse rake)	. 20	. 20	. 20
Push raking (two horses)	. 55	. 55	. 55
Raking after push rake (two-horse rake)	. 08	. 08	. 08
Stacking by hand	2. 50	2. 50	2. 50
Baling	4. 00	4. 00	4. 00
Total per ton	9. 83	8. 99	8. 58

The practice followed on this farm is the least efficient of any of the methods discussed, but it is all too common with many producers who are handling 100 or more acres of Johnson grass. This practice is suitable for farms on which the acreage in hay is too small to justify any considerable investment in haying equipment and on which labor is cheap and plentiful, but with a business of this size the use of power machinery in mowing would reduce the man labor for this operation by two-thirds, and the use of a stacker would cut down the man labor in stacking one-third.

SUMMARY

There is need for strengthening the demand for Johnson hay. This can be accomplished by keeping low-grade hay off the principal consuming and distributing markets, and by shipping only such quality of product as will meet the market demands. Therefore it is essential that producers adopt production practices that will result in the output of a greater percentage of good-quality hay, and seek other outlets for the lower grades.

A larger percentage of high-quality hay can be produced by adopting such practices of meadow management as will reduce the percentage of weeds and other foreign material in the hay; by cutting at a time to avoid an overripe, woody, and unpalatable product; by more careful methods of curing, cocking, and stacking to minimize the damage from bleaching and weather-staining; and by greater care in baling and storing the baled hay to avoid heating and going out of condition in the bale.

Under normal conditions the best quality of Johnson hay is cut before it has formed heads, is properly cured, and is gotten under shelter with the least possible exposure to weather. The method which will be most effective in accomplishing this depends largely on weather conditions, season of the year, supply of labor, storage room for the baled hay, and judgment of the individual producer.

Success in handling hay in stacks is dependent on ability to build stacks that will shed rain. Poorly constructed stacks are responsible for serious losses of quality in hay. Hay that has been allowed to go through a sweat in the stack may be loaded on cars as soon as baled with little danger of its going out of condition in transit.

Baling from the windrow results in a considerable saving in labor but is attended with greater risk than when hay is properly stacked and allowed to go through a sweat before baling. This method requires close supervision on the part of the operator, and unerring judgment as to when the hay is in proper condition to be baled with safety. Hay baled from the windrow should not be shipped for 20 to 30 days after baling, hence considerable room for storing the baled hay is essential where this method is practiced.

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